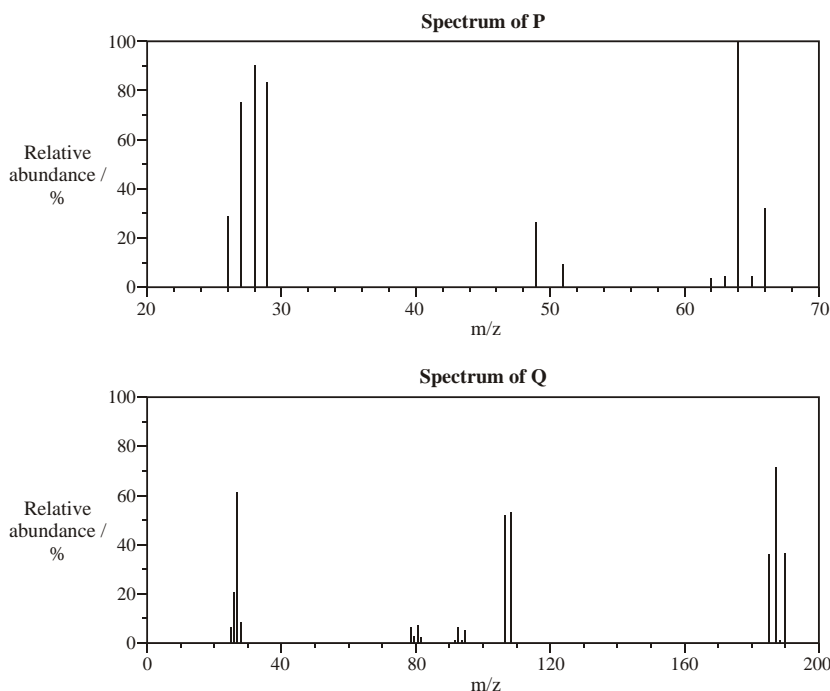


TAD03 – A4 IB Practice

Name.....

1. The mass spectra of halogenoalkanes show more than one line corresponding to the molecular ion. This is due to the presence of isotopes such as ^{35}Cl , ^{37}Cl , ^{79}Br and ^{81}Br .
- (a) Analyse the following spectra of halogenoalkanes **P** and **Q** and deduce the formula of all the molecular ion species.



[Source: NIST Mass Spec Data Center, S E Stein, director, "IR and Mass Spectra" in NIST Chemistry WebBook, NIST Standard Reference Database Number 69, Eds. P J Linstrom and W G Mallard, July 2001, National Institute of Standards and Technology, Gaithersburg MD, 20899 (<http://webbook.nist.gov>)]

species in **P**

species in **Q**

(3)

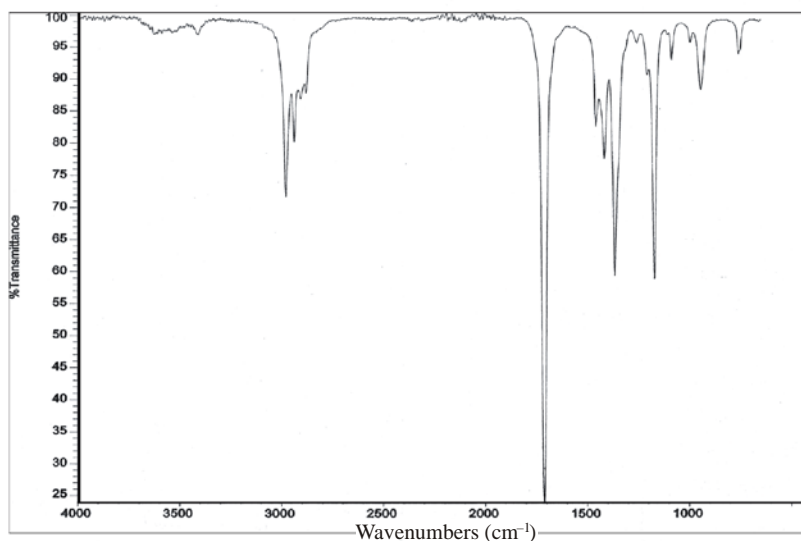
- (b) Predict the m/z values of the molecular ions for the compounds $\text{C}_2\text{H}_5\text{Br}$ and $\text{C}_2\text{H}_4\text{Cl}_2$

$\text{C}_2\text{H}_5\text{Br}$

$\text{C}_2\text{H}_4\text{Cl}_2$

(2) (Total 5 marks)

2. Compound **A**, with the molecular formula $\text{C}_3\text{H}_6\text{O}$ has this infrared spectrum.



- (a) (i) Use Table 18 in the Data Booklet to list **four** classes of compounds that have absorptions near 1700 cm^{-1} .

(1)

- (ii) Identify which of the classes listed in part (a)(i) could **not** have the molecular formula C_3H_6O .

(1)

- (b) The mass spectrum of compound **A** has prominent peaks at $m/z = 15$ and 29.

- (i) Deduce the formula of the species responsible for each peak.

$m/z = 15$

$m/z = 29$

(2)

- (ii) Deduce the structure of compound **A**.

(1)

(Total 5 marks)

3. Compounds **A** and **B** are alcohols with the molecular formula C_3H_8O . The following information was obtained from a mass spectrum of each alcohol.

A: peaks at $m/z = 29, 31, 60$

B: peaks at $m/z = 45, 60$

- (a) Deduce the formula of the species responsible for the peak at $m/z = 60$.

(1)

- (b) Deduce the formula of the species with $m/z = 31$.

(1)

- (c) Deduce the structure of each alcohol.

Structure of **A**

Structure of **B**

(2)

(Total 4 marks)

4. (a) (i) Explain why the mass spectrum of 2-chloro-2-methylpropane shows molecular ion peaks at m/z values of 92 and 94 in the ratio 3:1.

(2)

- (ii) Suggest the formulas of the species with the following m/z values in this spectrum:

$m/z = 77$

$m/z = 57$

(2)

- (b) Predict the m/z values of the three main molecular ion peaks in dichloromethane.

(2)

(Total 6 marks)